Assignment 5

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Compilation Guide:

gcc part1.c queue.c -lpthread -o part1
gcc part2.c -lpthread -o part2
gcc part3.c queue.c -lpthread -o part3
gcc part4.c -lpthread -o part4
gcc part5.c -lpthread -o part5
gcc part6a.c -lpthread -o part6a
gcc part6b.c -lpthread -o part6b
gcc part6c.c -lpthread -o part6c

1. Barbershop Problem
    a. The algorithm is included in the source code.
    b. Check part1.c
    c. Below is the program called with default arguments.

```
C:\Users\chris\Documents\projects\os-hw-5>part1
There are 3 chairs and 10 customers.
Starting simulation.
Customer 0 woke up the barber.
The barber is serving Customer 0 now.
Customer 1 sat down in a waiting chair.
The barber is serving Customer 1 now.
Customer 2 sat down in a waiting chair.
Customer 3 sat down in a waiting chair.
The barber is serving Customer 2 now.
Customer 4 sat down in a waiting chair.
The barber is serving Customer 3 now.
Customer 5 sat down in a waiting chair.
Customer 6 sat down in a waiting chair.
Customer 7 exploded and died.
Customer 8 exploded and died.
The barber is serving Customer 4 now.
Customer 9 sat down in a waiting chair.
The barber is serving Customer 5 now.
The barber is serving Customer 6 now.
The barber is serving Customer 9 now.
The barber is finished cutting customers' hair.
The barber shop has closed.
```

d. Below is the program. It was called with two custom arguments.

```
part1 1 4
There are 1 chairs and 4 customers.
Starting simulation.
Customer 0 woke up the barber.
The barber is serving Customer 0 now.
Customer 1 sat down in a waiting chair.
The barber is serving Customer 1 now.
Customer 2 sat down in a waiting chair.
Customer 3 exploded and died.
The barber is serving Customer 2 now.
The barber is finished cutting customers' hair.
The barber shop has closed.
```

2. Smoker Problem
    a. The pseudocode is included in source code.
    b. Check part2.c
    c. Below is the program called with 10 iterations.

```
part2 10
Starting simulation now for 10 iterations.
Agent dispensing tobacco and paper now.
Smoker Matches is smoking now.
Agent dispensing tobacco and paper now.
Smoker Matches is smoking now.
Agent dispensing tobacco and matches now.
Smoker Paper is smoking now.
Agent dispensing tobacco and matches now.
Smoker Paper is smoking now.
Agent dispensing tobacco and paper now.
Smoker Matches is smoking now.
Agent dispensing tobacco and matches now.
Smoker Paper is smoking now.
Agent dispensing tobacco and matches now.
Smoker Paper is smoking now.
Agent dispensing paper and matches now.
Smoker Tobacco is smoking now.
Agent dispensing tobacco and matches now.
Smoker Paper is smoking now.
Agent dispensing tobacco and paper now.
Smoker Matches is smoking now.
```

    d. Below is the program called with 2 iterations.

```
part2 2
Starting simulation now for 2 iterations.
Agent dispensing paper and matches now.
Smoker Tobacco is smoking now.
Agent dispensing tobacco and matches now.
Smoker Paper is smoking now.
```

3. TA Office Hours Problem
    a. Check part3.c for pseudocode.
    b. Check part3.c

c. Program called with default arguments.

```
part3
Inputs: 5 students, 2 seconds for TA to help, 1 seconds for students to appear
Student 0 woke up the TA.
The TA is ready for another student.
The TA is helping Student 0 now.
Student 1 sat down in a waiting chair.
The TA is ready for another student.
The TA is helping Student 1 now.
Student 2 sat down in a waiting chair.
Student 3 sat down in a waiting chair.
The TA is ready for another student.
The TA is helping Student 2 now.
Student 4 sat down in a waiting chair.
The TA is ready for another student.
The TA is helping Student 3 now.
The TA is ready for another student.
The TA is helping Student 4 now.
The TA has survived office hours!
```

d. Program called with custom arguments.

```
part3 2 1 5
Inputs: 2 students, 1 seconds for TA to help, 5 seconds for students to appear
Student 0 woke up the TA.
The TA is ready for another student.
The TA is helping Student 0 now.
The TA is ready for another student.
The TA is going to sleep now.
Student 1 woke up the TA.
The TA is ready for another student.
The TA is helping Student 1 now.
The TA has survived office hours!
```

```
part3 5 7 1
Inputs: 5 students, 7 seconds for TA to help, 1 seconds for students to appear
Student 0 woke up the TA.
The TA is ready for another student.
The TA is helping Student 0 now.
Student 1 sat down in a waiting chair.
Student 2 sat down in a waiting chair.
Student 3 sat down in a waiting chair.
Student 4 will come back in 5 seconds.
The TA is ready for another student.
The TA is helping Student 1 now.
Student 4 sat down in a waiting chair.
The TA is ready for another student.
The TA is helping Student 2 now.
The TA is ready for another student.
The TA is helping Student 3 now.
The TA is ready for another student.
The TA is helping Student 4 now.
The TA has survived office hours!
```

4. Readers-Writers Problem
    a. Pseudocode in part4.c
    b. Check part4.c

c.

```
gcc part4.c -lpthread -o part4
part4
usage: part4 [10 char string containing r and w only]
Writer 0 lined up!
Writer 0 blocking noobs from reading now.
Writer 0 is writing!
Writer 1 lined up!
Writer 0 finished!
Writer 1 blocking noobs from reading now.
Writer 1 is writing!
Reader 2 lined up!
Reader 3 lined up!
Writer 1 finished!
Writer 4 lined up!
Writer 4 blocking noobs from reading now.
Reader 3 is reading!
Reader 2 is reading!
Reader 5 lined up!
Reader 6 lined up!
Reader 2 finished!
Reader 3 finished!
Last reader 3 has turned off the lights.
Writer 4 is writing!
Reader 7 lined up!
Reader 8 lined up!
Writer 4 finished!
Reader 5 is reading!
Reader 6 is reading!
Reader 7 is reading!
Reader 8 is reading!
Reader 9 lined up!
Reader 9 is reading!
Reader 5 finished!
Reader 8 finished!
Reader 7 finished!
Reader 6 finished!
Reader 9 finished!
Last reader 9 has turned off the lights.
```

d. Custom arguments.

```
part4 rrwrrrrrrrrrrrrrrr
Reader 0 lined up!
Reader 0 is reading!
Reader 1 lined up!
Reader 1 is reading!
Writer 2 lined up!
Writer 2 blocking noobs from reading now.
Reader 0 finished!
Reader 3 lined up!
Reader 1 finished!
Last reader 1 has turned off the lights.
Writer 2 is writing!
Reader 4 lined up!
Reader 5 lined up!
Writer 2 finished!
Reader 3 is reading!
Reader 4 is reading!
Reader 5 is reading!
Reader 6 lined up!
Reader 6 is reading!
Reader 7 lined up!
Reader 7 is reading!
Reader 8 lined up!
Reader 8 is reading!
Reader 3 finished!
Reader 5 finished!
Reader 4 finished!
Reader 6 finished!
Reader 9 lined up!
Reader 9 is reading!
Reader 7 finished!
Reader 8 finished!
Reader 9 finished!
Last reader 9 has turned off the lights.
```

5. Single-lane Bridge Problem
    a. Check part5.c
    b. Check part5.c
    c. Check part5.c
6. Monkey Rope Bridge Problem
    a. Check part6a.c
    b. Check part6b.c
    c. Check part6c.c